

[0057]

CLAIMS

We claim:

1 1. A gas distribution showerhead assembly for use within a semiconductor processing
2 chamber, including:

3 an electrode having a plurality of openings therethrough;

4 a gas distribution plate attached to a first, lower major surface of said electrode,
5 wherein said gas distribution plate includes a plurality of through-holes for delivering
6 processing gases into said semiconductor processing chamber; and

7 a removable insert which fits into an opening in said electrode through which gas
8 flows, wherein spacing between surfaces of said removable insert and surfaces of said electrode
9 is adequate to permit gas flow, but inadequate for plasma ignition within the opening.

1 2. A gas distribution showerhead assembly in accordance with Claim 1, wherein a gap
2 between a surface of said removable insert and a surface of said electrode is 0.020 inch or less.

1 3. A gas distribution showerhead assembly in accordance with Claim 2, wherein a gap
2 between a surface of said removable insert and a surface of said electrode is within the range
3 of about 0.010 inch to about 0.015 inch.

1 4. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 removable insert comprises a removable pin plate including a plurality of pins, wherein said
3 removable pin plate is disposed over a second, upper surface of said electrode in a manner such
4 that said plurality of pins fits within said plurality of openings within said electrode.

1 5. A gas distribution showerhead assembly in accordance with Claim 4, wherein a gap
2 between an exterior surface of a pin and a surface of an opening in said electrode into which
3 said pin fits is 0.020 inch or less.

1 6. The gas distribution showerhead assembly of Claim 5, wherein a gap between an
2 exterior surface of a pin and a surface of an opening in said electrode into which said pin fits
3 is within the range of about 0.010 inch to about 0.015 inch.

1 7. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 electrode is formed from a material selected from the group consisting of aluminum, ceramic,
3 Si-Si carbide, and graphite converted to silicon carbide.

1 8. A gas distribution showerhead assembly in accordance with Claim 7, wherein said
2 electrode is formed from anodized aluminum.

1 9. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 removable insert is formed from a material selected from the group consisting of aluminum,
3 ceramic, Si-Si carbide, and graphite converted to silicon carbide.

1 10. A gas distribution showerhead assembly in accordance with Claim 9, wherein said
2 removable insert is formed from anodized aluminum.

- 1 11. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 gas distribution plate is formed from a material selected from the group consisting of silicon
3 carbide, yttrium oxide, anodized aluminum, ceramic, quartz, and silicon.
- 1 12. A gas distribution showerhead assembly in accordance with Claim 11, wherein said
2 gas distribution plate is formed from silicon carbide.
- 1 13. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 electrode is formed from aluminum, wherein said gas distribution plate is formed from silicon
3 carbide, and wherein said electrode and said gas distribution plate are bonded together.
- 1 14. A gas distribution showerhead assembly in accordance with Claim 13, wherein said
2 electrode and said gas distribution plate are bonded together using a silicone-based adhesive.
- 1 15. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 through-holes in said gas distribution plate are crescent-shaped.
- 1 16. A gas distribution showerhead assembly in accordance with Claim 15, wherein
2 spacing between walls of said crescent is adequate to permit gas flow, but inadequate for plasma
3 ignition within the opening.
- 1 17. A gas distribution showerhead assembly in accordance with Claim 16, wherein
2 spacing between walls of said crescent is 0.020 inch or less.

1 18. A gas distribution showerhead assembly in accordance with Claim 17, wherein
2 spacing between walls of said crescent is within the range of about 0.010 inch to about 0.015
3 inch.

1 19. A gas distribution showerhead assembly in accordance with Claim 1, wherein said
2 gas distribution showerhead assembly is adapted for use in a semiconductor processing chamber
3 selected from the group consisting of an etch chamber and a chemical vapor deposition (CVD)
4 chamber.